

WHAT IS CLAIMED IS:

1. A scanning apparatus, the scanning apparatus being suitable for scanning an object along a first axis, the scanning apparatus comprising:

5 a first actuator;

a first stage, the first stage being coupled to the first actuator, the first actuator being arranged to move the first stage along the first axis;

a second stage, the second stage being arranged to accommodate the object;

10 a first coupler, the first coupler having a first end and a second end, the first coupler being aligned along the first axis, wherein the first end of the first coupler is arranged to contact the first stage and the second end of the first coupler is arranged to contact the second stage; and

15 a second coupler, the second coupler having a first end and a second end, the second coupler being aligned along the first axis, wherein the first end of the second coupler is arranged to contact the first stage and the second end of the second coupler is arranged to contact the second stage, and wherein when the first actuator causes the first stage to scan along the first axis in a first direction, the first coupler causes the second stage to scan along the first axis through the first coupler.

20 2. A scanning apparatus according to claim 1 further including:

a second actuator, the second actuator being arranged to act between the first stage and arranged to move the second stage along the first axis substantially independently from the first stage.

25 3. A scanning apparatus according to claim 2 wherein the first actuator is arranged to accelerate the first stage and the second stage along the first axis, and the second actuator is arranged to accelerate the second stage along the first axis.

4. A scanning apparatus according to claim 2 wherein when the first actuator causes the first stage to scan along the first axis in a first direction, the first coupler is in a first state and the second coupler is in a second state.

5. A scanning apparatus according to claim 4 wherein when the first coupler is in the first state, the first coupler provides a substantially rigid coupling between the first stage and the second stage, and wherein when the second coupler is in the second state, the second coupler enables substantially minimal vibrations to be transmitted between the first stage and the second stage through the second coupler.

6. A scanning apparatus according to claim 4 wherein the first coupler is a first cord and the second coupler is a second cord, wherein the first coupler is in the first state, the first cord is substantially taut, and when the second coupler is in the second state, the second cord is substantially slack.

7. A scanning apparatus according to claim 2 wherein when the first actuator causes the first stage to scan along the first axis in a second direction, the first coupler is in a second state and the second coupler is in a first state.

8. A scanning apparatus according to claim 7 wherein when the first coupler is in the first state, the first coupler provides a substantially rigid coupling between the first stage and the second stage, and wherein when the second coupler is in the second state, the second coupler enables substantially minimal vibrations to be transmitted between the first stage and the second stage through the second coupler.

9. A scanning apparatus according to claim 1 wherein when the first stage is not moving, the first coupler and the second coupler are arranged such that the first coupler and the second coupler enable substantially minimal vibrations to be transmitted between the first stage and the second stage.

10. A scanning apparatus according to claim 1 wherein the first coupler is a stopper, the first end of the coupler being a first end of the stopper that is substantially directly coupled to the first stage, the second end of the coupler being a second end of the stopper being arranged to contact the second stage to substantially push the second stage when the first actuator causes the first stage to scan along the first axis in the first direction.

11. An exposure apparatus comprising the scanning apparatus of claim 1.

12. A device manufactured with the exposure apparatus of claim 11.

13. A wafer on which an image has been formed by the exposure apparatus of claim 11.

14. A scanning apparatus, the scanning apparatus being suitable for scanning a reticle along a first axis, the scanning apparatus comprising:

a first actuator;

a coarse stage, the coarse stage being coupled to the first actuator, the first actuator being arranged to accelerate the coarse stage along the first axis;

a fine stage, the fine stage being arranged to carry the reticle thereon; and

a first coupler, the first coupler having a first end and a second end, the first coupler having a central axis, the central axis of the first coupler being aligned along the first axis, the first end of the first coupler being arranged to be carried by the coarse stage and the second end of the first coupler being arranged to be carried by the fine stage, wherein when the first actuator causes the coarse stage to scan along the first axis in a first direction, the first coupler enables a relatively high transmissibility between the coarse stage and the fine stage through the first coupler such that the fine stage scans along the first axis with the coarse stage, and wherein when the first actuator causes the coarse stage to scan along the first axis in a second direction, the first coupler enables a relatively low transmissibility between the coarse stage and the fine stage through the first coupler.

15. A scanning apparatus according to claim 14 further including:

a second coupler, the second coupler having a first end and a second end, the second coupler having a central axis, the central axis of the second coupler being aligned along the first axis, the first end of the second coupler being arranged to be carried by the coarse stage and the second end of the second coupler being arranged to be carried by the fine stage, wherein when the first actuator causes the coarse stage to scan along the first axis in the first direction, the second coupler enables a relatively low transmissibility between the coarse stage and the fine stage through the second coupler.

16. A scanning apparatus according to claim 15 wherein when the first actuator causes the coarse stage to scan along the first axis in the second direction, the second coupler enables a relatively high transmissibility between the coarse stage and the fine stage through the second coupler.

17. A scanning apparatus according to claim 16 further including:

a second actuator, the second actuator being arranged to act between the coarse stage and the fine stage to cause the fine stage to accelerate without accelerating the coarse stage.

18. A scanning apparatus according to claim 17 wherein when the second actuator causes the fine stage to accelerate, the first coupler enables a relatively low transmissibility between the coarse stage and the fine stage through the first coupler and the second coupler enables a relatively low transmissibility between the coarse stage and the fine stage through the second coupler.

19. A scanning apparatus according to claim 16 wherein the first coupler includes a first cord and the second coupler includes a second cord.

20. A scanning apparatus according to claim 19 wherein when the first coupler enables a relatively high transmissibility between the coarse stage and the fine stage through the first coupler, the first cord is substantially in tension between the coarse stage and the fine stage, and wherein when the first coupler enables a relatively low transmissibility between the coarse stage and the fine stage through the first coupler, the first cord is substantially slack between the coarse stage and the fine stage.

21. A scanning apparatus according to claim 20 wherein when the second coupler enables a relatively high transmissibility between the coarse stage and the fine stage through the second coupler, the second cord is substantially in tension between the coarse stage and the fine stage, and wherein when the second coupler enables a relatively low transmissibility between the coarse stage and the fine stage through the second coupler, the second cord is substantially slack between the coarse stage and the fine stage.

22. An exposure apparatus comprising the scanning apparatus of claim 14.

23. A device manufactured with the exposure apparatus of claim 22.

24. A wafer on which an image has been formed by the exposure apparatus of claim

25. A scanning apparatus, the scanning apparatus being suitable for scanning a reticle along a first axis, the scanning apparatus comprising:

a first actuator;

a coarse stage, the coarse stage being coupled to the first actuator, the first actuator being arranged to accelerate the coarse stage along the first axis;

a fine stage, the fine stage being arranged to carry the reticle thereon; and

a first cord, the first cord having a first end and a second end, the first cord also having a central axis, the central axis of the first cord being substantially aligned along the first axis, the first end of the first cord being arranged to be coupled to the coarse

stage and the second end of the first cord being arranged to coupled to the fine stage, wherein when the first actuator causes the coarse stage to accelerate along the first axis in a first direction, the first cord is substantially stiff between the coarse stage and the fine stage such that the first cord enables a relatively high transmissibility between the coarse stage and the fine stage therethrough, and wherein when the first actuator causes the coarse stage to accelerate along the first axis in a second direction, the first cord is substantially slack between the coarse stage and the fine stage such that the first cord enables a relatively low transmissibility between the coarse stage and the fine stage therethrough.

26. A scanning apparatus according to claim 25 further including:

a second cord, the second cord having a first end and a second end, the second cord having a central axis, the central axis of the second cord being aligned along the first axis, the first end of the second cord being arranged to be carried by the coarse stage and the second end of the second coupler being arranged to be carried by the fine stage, wherein when the first actuator causes the coarse stage to accelerate along the first axis in the second direction, the second cord is substantially stiff between the coarse stage and the fine stage such that the second cord enables a relatively high transmissibility between the coarse stage and the fine stage therethrough, and wherein when the first actuator causes the coarse stage to accelerate along the first axis in the first direction, the second cord is substantially slack between the coarse stage and the fine stage such that the second cord enables a relatively low transmissibility between the coarse stage and the fine stage therethrough.

27. A scanning apparatus according to claim 26 wherein the first cord is arranged to be substantially slack and the second cord is arranged to be substantially slack when the coarse stage is not accelerating.

28. A scanning apparatus according to claim 26 further including:

a second actuator, the second actuator being arranged to cause the fine stage to accelerate along the first axis when the coarse stage is not accelerating, wherein when the second actuator causes the fine stage to accelerate along the first axis, at least one of the first cord and the second cord is substantially slack.

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29. A scanning apparatus according to claim 28 wherein when the second actuator causes the fine stage to accelerate along the first axis, the first cord is substantially slack and the second cord is substantially slack.

10 30. An exposure apparatus comprising the scanning apparatus of claim 25.

31. A device manufactured with the exposure apparatus of claim 30.

15 32. A wafer on which an image has been formed by the exposure apparatus of claim 30.

33. A scanning apparatus, the scanning apparatus being suitable for scanning an object along a first axis, the scanning apparatus comprising:

a first surface;

20 a second surface;

a first coupler, the first coupler having a first end and a second end, the first coupler being aligned along the first axis, wherein the first end of the first coupler is arranged to be coupled to the first surface;

25 a first stage mechanism, the first stage mechanism being arranged to accommodate the object, wherein the second end of the first coupler is arranged to be coupled to the first stage mechanism, wherein the first surface is arranged to cause the first stage mechanism to move along the first axis through the first coupler; and

30 a second coupler, the second coupler having a first end and a second end, the second coupler being aligned along the first axis, wherein the first end of the second coupler is arranged to be coupled to the first stage mechanism and the second end of the

second coupler is arranged to be coupled to the second surface, and wherein when the first surface causes the first stage mechanism to move along the first axis in a first direction, the first coupler is in a first state and the second coupler is in a second state.

5 34. A scanning apparatus according to claim 33 wherein the first surface is associated with a first actuator and the second surface is associated with a second actuator.

35. A scanning apparatus according to claim 34 further including:
a third actuator, the third actuator being arranged to cooperate with first actuator
10 and the first coupler to move the first stage mechanism along the first axis.

36. An exposure apparatus comprising the scanning apparatus of claim 33.

15 37. A device manufactured with the exposure apparatus of claim 36.

38. A wafer on which an image has been formed by the exposure apparatus of claim
36.

39. A positioning apparatus comprising:
20 a first stage, the first stage being arranged to be movable along at least one axis;
a first driving device coupled to the first stage, the first driving device moving the first stage along the at least one axis;
a second stage, the second stage being arranged to be movable with the first stage along the at least one axis;

25 a second driving device coupled to the second stage, the second driving device moving the second stage relative to the first stage; and

a transmitter disposed between the first stage and the second stage, the transmitter transmitting force between the first stage and the second stage, wherein when the first driving device accelerates the first stage along the at least one axis, the transmitter
30 transmits the force such that the first stage provides a pulling force on the second stage

from a direction of movement of the second stage, and when at least one of a first speed of the first stage and a second speed of the second stage is substantially constant, the second driving device moves the second stage to position the second stage at a desired position.

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40. An exposure apparatus comprising the positioning apparatus of claim 39.

41. A device manufactured with the exposure apparatus of claim 40.

10 42. A wafer on which an image has been formed by the exposure apparatus of claim 39.

43. A method for positioning an object, the method comprising:

accelerating a first stage along at least one axis;

15 accelerating a second stage with the first stage along the at least one axis by transmitting force between the first stage and the second stage by utilizing a transmitter; and

20 positioning the second stage by utilizing a driving device that moves the second stage relative to the first stage when at least one of a first speed of the first stage and a second speed of the second stage is constant, wherein the transmitter transmits the force such that the first stage acts as a pulling force on the second stage from a direction of movement of the second stage.

25 44. A method for operating an exposure apparatus comprising the method for positioning an object of claim 43.

45. A method for making an object including at least a photolithography process, wherein the photolithography process utilizes the method of operating an exposure apparatus of claim 44.

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46. A method for making a wafer utilizing the method of operating an exposure apparatus of claim 44.